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Enroth, Johannes

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CONTRIBUTIONS TO THE MOSS FAMILIES NECKERACEAE AND PTEROBRYACEAE OF BHUTAN

МАТЕРИАЛЫ К ФЛОРЕ МХОВ БУТАНА: СЕМЕЙСТВА NECKERACEAE И PTEROBRYACEAE

JOHANNES ENROTH[1] & JAMES R. SHEVOCK[2]

ЙОХАННЕС ЭНРОТ[1], ДЖЕЙМС Р. ШЕВОК[2]

Abstract

Three species previously thought to be Chinese endemics from the easternmost Himalayas are reported from Bhutan: *Shevockia inunctocarpa* Enroth & M.C. Ji and *Taiwanobryum yunnanense* (Enroth) Enroth *comb. nov*. of the Neckeraceae, and *Calyptothecium acostatum* J.X. Luo of the Pterobryaceae. The latter, originally described from Xizang, is also reported from Yunnan, China. Additionally, *Noguchiodendron sphaerocarpum* (Nog.) Ninh & Pócs is reported for the second time (since 1971) from Bhutan.

Резюме

Для трех видов, считавшихся эндемиками Китая, приводятся находки из наиболее восточных районов Восточных Гималаев, с территории Бутана: *Shevockia inunctocarpa* Enroth & M.C. Ji и *Taiwanobryum yunnanense* (Enroth) Enroth, *comb. nov*. из семейства Neckeraceae, и *Calyptothecium acostatum* J.X. Luo из семейства Pterobryaceae. Последний вид, описанный из Тибетского автономного района Китая, приводится также впервые для китайской провинции Юннань. Для *Noguchiodendron sphaerocarpum* (Nog.) Ninh & Pócs приводится второе местонахождение в Бутане (после первого указания в 1971 году).

KEYWORDS: Himalayan mosses, distribution, endemics

INTRODUCTION

For taxonomic studies of the Neckeraceae in Asia, the first author was sent a batch of specimens collected mainly by Prof. G. Miehe (Marburg, Germany) in Bhutan and Xizang, China in 1998–2000. The bryoflora of the Himalayan region generally is still quite poorly known, although it is one of the hotspots of bryophyte diversity and endemism (e.g. Tan & Pócs, 2000). Ongoing inventory efforts by the second author and colleagues Wenzhang Ma (KUN) and David Long (E) continue to document the high species diversity in the easternmost Himalayas.

A checklist of the mosses of Bhutan (Long, 1994; Long & Thomas, 2017) presents a total of 156 genera and 282 species. According to those authors, Bhutan is probably one of the bryologically richest Himalayan countries yet one of the least well-known and few bryologists have had the opportunity to work in the country. The collections reported here come from cool-temperate forests with e.g. *Acer, Fagus, Quercus, Pinus* and *Tsuga* as prominent tree genera (see Fang *et al*., 1996).

NECKERACEAE

Noguchiodendron sphaerocarpum (Nog.) Ninh & Pócs (Fig. 1)

Specimens examined: Bhutan. Tashigang, Tashiyangtse, W of Risum Gompa, evergreen oak forest on SW-facing slope, grazed in winter, 27°42’N 91°27’E, 2600 m a.s.l., 7.VI.2000, *G. & S. Miehe 00-84-40* (H).

Noguchiodendron sphaerocarpum is the single representative of its genus. It was segregated from *Homaliodendron* M. Fleisch. on morphological grounds (Ninh & Pócs, 1981) and molecular data supports its generic status distinct from *Homaliodendron* s. str. (Olsson *et al.,* 2016). Its morphological distinctions were discussed by Ma & Shevock (2015) and it has since been collected from several additional counties in Yunnan.

This species was previously reported from Bhutan (Tashiling) by Noguchi (1971, as *Homaliodendron sphaerocarpum* Nog.), but to our knowledge there are no subsequent records from the country. The Tashiling specimens came from 2400–2450 m a.s.l. and the specimens reported here from eastern Bhutan were collected at 2600 m a.s.l.

[1] – Botanical Museum, P.O.Box 7, FI-00014 University of Helsinki, Finland; e-mail: johannes.enroth@helsinki.fi; ORCID: 0000-0002-2028-6910
[2] – California Academy of Sciences, 55 Music Concourse Dr., San Francisco, California 94118 USA; ORCID: 0000-0003-1283-0709

Fig. 1. *Noguchiodendron sphaerocarpum* (from *G. & S. Miehe 00-84-40*). Scale bar = 2 cm.

Noguchiodendron sphaerocarpum is distributed in the general Himalayan region, from Nepal through Himalayan India and Bhutan to Yunnan in China, Myanmar and down to northern Thailand (Tanaka *et al.*, 2003; Ma & Shevock, 2015; present report). It was reported from Western Ghats (Tamil Nadu, as *Homaliodendron sphaerocarpum*) by Daniels & Daniel (2007), but the record needs verification. Some of the illustrations in that paper appear to have been copied or modified from Gangulee (1976: p. 1422, fig. 702).

Illustrations: Gangulee 1976: fig. 702; Ninh & Pócs 1981: figs. 1–3; Ma & Shevock 2015: figs. 3 and 4.

Shevockia inunctocarpa Enroth & M.C. Ji

Specimen examined: Bhutan. Tashigang, Tashiyangtse, Pang La E side, *Tsuga-Acer-Rhododendron* forest on SE-facing slope, 27°44'N 91°24'E, 3260 m a.s.l., epiphyte, 8.VI.2000, *G. & S. Miehe 00-86-02* (H).

This genus currently with a single species was described from the Gaoligongshan Range in Yunnan, China, by Enroth & Ji (2006). *Shevockia inunctocarpa* is currently known from Fu-gong and Gong-shan counties in Yunnan. Its generic status in the *Pinnatella* clade of the Neckeraceae is supported by molecular data (Olsson *et al*., 2010). The type specimen from Yunnan was collected at 2700 m a.s.l. and the Bhutan specimen at 3260 m a.s.l.

The Bhutan specimen reported here is not in good condition and it lacks sporophytes. However, the characteristically shaggy habit as well as the complanate and asymmetric, curved leaves, plicate in their basal parts and with a costa mostly reaching to midleaf, are typical of *Shevockia*, and even more so are the spreading stipe leaves with recurved margins and – to our knowledge unique in the Neckeraceae – rhizoidal tomentum among the stipe leaves.

Illustrations: Enroth & Ji 2006: figs. 1–4.

Taiwanobryum yunnanense (Enroth) Enroth, *comb. nov.* (Fig. 2). Basionym: *Neckera yunnanensis* Enroth, Hikobia 12: 3. fig. 2. 1996.

Fig. 2. *Taiwanobryum yunnanense* (from *G. & S. Miehe 99-222-80*). Scale bar = 3 cm.

Fig. 3. *Calyptothecium acostatum* (from *G. & S. Miehe 00-63-39*). Scale bar = 3 cm.

Specimens examined: Bhutan. Wangdue Phodrang, Punakha, Puna Tsang Chu, Chuselumba, evergreen *Quercus* forest with *Cupressus* and *Pinus* on E-facing slope, logging and grazing, 27°24'N 89°56'E, 2630 m a.s.l., 7.X.1999, *G. & S. Miehe 99-210-54* (H); same coordinates, *Quercus-Pinus* forest with *Cupressus* emergents on W-facing slope, little disturbed, 2590 m a.s.l., 8.X.1999, *G. & S. Miehe 99-213-24* (H). Wangdue Phodrang, Punakha, Upper Dabg Chu catchment, Ngoe Chu, *Tsuga-Cupressus* forest regenerating after fire on E-facing slope, 27°37'N 90°10'E, 2500 m a.s.l., 14.X.1999, *G. & S. Miehe 99-222-80* (H, three duplicates). Tashigang, Tashiyangtse W of Risum Gompa, evergreen oak forest on SW-facing slope, grazed in winter, 27°42'N 91°27'N, 2600 m a.s.l., epiphytes on trunks, 7.VI.2000, *G. & S. Miehe 00-84-40* (H). Lhuntse, Upper Kuru Chu, lower Sirsimbi Chu, E of Serchong, *Quercus-Alnus-Betula* secondary forest with *Cupressus* on SW-facing marble rock flank, 27°50' N 91°9' E, epiphytes, 27.I.2001, *G. & S. Miehe 00-489-28* (H).

The new combination is based on a phylogenetic analysis (to be published in a forthcoming paper by the first author and colleagues) and on morphology. *Taiwanobryum yunnanense* resembles the more widespread *T. crenulatum* (Harv.) S. Olsson, Enroth & D. Quandt, but has clearly less distinct alar cells, non-decurrent leaf bases and mostly more strongly serrate leaf apices (Enroth, 1996; Wu, 2011a).

Taiwanobryum yunnanense was known only from Yunnan (Lu-shui, Teng-chong and Gong-shan counties) of the Gaoligongshan Range. Based on specimens at H, it grows between 1700–2700 m a.s.l., and the seven specimens from Bhutan were collected at 2500–2630 m a.s.l. In China it grows on hardwood trunks. The Bhutanese specimens mostly lack data on the substrate, but on the labels the habitats are described as hardwood or mixed hardwood-conifer forests and two of the specimens were epiphytes.

Illustrations: Enroth 1996: fig. 2; Wu 2011 (as *Neckera yunnanensis*): p. 357, pl. 382, figs. 13–18.

PTEROBRYACEAE

Calyptothecium acostatum J.X. Luo (Fig. 3)

Specimens examined: Bhutan. Wangdue Phodrang, N of Kothoka, *Quercus glauca* forest with *Pinus wallichiana* and *Tsuga* emergents, little grazed, on mountain spur, 27°22'N 89°57'E, 2520 m a.s.l., 8.X.1998, *G. & S. Miehe 98-384-20* (H); same coordinates, little disturbed *Quercus lanata-Quercus griffithii* forest on S-facing slope, 9.X.1998, *G. & S. Miehe 98-385-27* (H). Tashigang, Tashiyangtse, Dong La E side, evergreen *Quercus* forest with emergent *Pinus bhutanica* trees on SE-facing slope, little grazed, 27°25' N 91°24' E, 2540 m a.s.l., beard mosses (lower branches), 30.V.2000, *G. & S. Miehe 00-63-39* (H).

Calyptothecium acostatum was described from eastern Xizang (Luo, 1983), but collections obtained since 2005 extend its distribution southward to the Gaoligongshan portion of the Hengduan Mountains in NW Yunnan (https://www.tropicos.org/name/35112411). The species is easily distinguished by the very large basal auricles in the leaves, and by the very weak or (mostly) absent costa (Yu & He, 2011). The Xizang type material was collected on tree trunks at 2300–2400 m a.s.l., and

the Yunnan material ranges between 1900 and 2400 m a.s.l. The Bhutan specimens reported here occur between 2410 and 2540 m a.s.l. Two of the specimens lack information on the substrate, but one is described as "beard mosses (lower branches)".

Illustrations: Lou 1983: p. 225, figs. 10–12; Yu & He, 2011: p. 218, pl. 336, figs. 1–3.

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